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EXAMINER	
DIAMOND, ALAN D	
ART UNIT	PAPER NUMBER
1753	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,339	TSUGE, SADAJI	
	Examiner	Art Unit	
	Alan Diamond	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,5 and 7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5 and 7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 February 2001 and 16 December 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 5, 2005 has been entered.

Claim Objections

2. Claims 2 and 7 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 2 does not further limit parent claim 1 because the limitation of claim 2 is inherently present in claim 1. In claim 1, the thin film amorphous semiconductor layer is positioned opposite the light incidence side light transmitting member by interposing the crystalline silicon substrate therebetween. Since the light incidence side light transmitting member in claim 1 is positioned at a principal light incidence side, then in claim 1, light enters from a side of the crystalline substrate, as in claim 2. In other words, in claim 1, light enters at the principal light incidence side of said light transmitting member. Said light transmitting member is then followed by the crystalline substrate, which is followed by the amorphous semiconductor layer.

Claim 7 does not further limit parent claim 1 because claim 1 requires that the solar cell element has an amorphous semiconductor layer (see lines 13-15 of claim 1). Thus, claim 7, which sets forth that the solar cell element includes an amorphous semiconductor layer, is setting forth what is already present in claim 1.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1, 2, 4, 5, and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite because it is not clear which of the plural solar cell elements is being referred to by the term "the solar cell element" at line 13. It is suggested that the term "the solar cell element has" at line 13 of claim 1 be changed to "each solar cell element has". The same applies to dependent claims 2, 4, 5, and 7.

In claim 1, at lines 21-24 (i.e., lines 3-6 on page 3 of the claims), the thin film amorphous semiconductor layer does not form a p-n junction "between the crystalline silicon substrate", but rather, a p-n junction is formed between the thin film amorphous semiconductor layer and the crystalline silicon substrate. Furthermore, there are plural of the thin film amorphous semiconductor layer and plural of the crystalline silicon substrate due to the fact that there are plural solar cell elements. Thus, at said lines 21-24, it is not clear which one of the plural thin film amorphous semiconductor layers and crystalline silicon substrates is being referred to. In order to clarify claims 21-24 of claim

1, it is suggested that these lines, in their entirety, be rewritten as "each said thin film amorphous semiconductor layer which forms the p-n junction with a said crystalline silicon substrate is positioned opposite the light incidence side light transmitting member by interposing the respective crystalline silicon substrate therebetween; and". The same applies to dependent claims 2, 4, 5, and 7.

Claim 2 is indefinite because it is not clear which of the plural solar cell elements in parent claim 1 is being referred to by the term "the solar cell element" at line 2. It is suggested that the term "the solar cell element is" at line 2 of claim 2 be changed to "each solar cell element is". Please note that this will not cure the objection under 37 CFR 1.75(c) to claim 2 set forth above in the instant Office action.

Claim 7 is indefinite because it is not clear which of the plural solar cell elements in parent claim 1 is being referred to by the term "the solar cell element" at each of lines 2 and 3. It is suggested that the term "the solar cell element" at each of lines 2 and 3 of claim 7 be changed to "each solar cell element". Please note that this will not cure the objection under 37 CFR 1.75(c) to claim 7 set forth above in the instant Office action.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 4, 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-307791 (herein referred to as JP '791) in view of Yamagishi et

al (U.S. Patent 6,300,556), Green et al (U.S. Patent 5,942,050), Brandhorst, Jr (U.S. Patent 4,131,486), and Spitzer (U.S. Patent 4,667,060).

Regarding claim 1, JP '791 disclose a solar cell module comprising solar cells **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** (which is at the principal light incidence side) and a resin film rear surface member **4** (see Figure 1; and paragraphs 0023 and 0026-0028). Both the front surface side light transmitting member **3** and the rear surface member **4** transmit incident light (see Figure 1). The sealing resin **2** is interposed between the front surface light transmitting member **3** and the solar cells **1** and is also interposed between the rear surface member **4** and the solar cells **1** (see Figure 1). The solar cell **1** comprises a n-type crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon, including p-type amorphous layer **14**, which forms a pin junction with the substrate **11** (see Figure 2; and paragraph 0024). The solar cell **1** also has two transparent electrodes **14** and **18** at the top and bottom surfaces (see Figure 2; and paragraph 0024). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (see Figure 1).

Regarding claim 2, light is incident from both sides of the solar cell (see Figure 1).

Regarding claims 4 and 5, the rear surface member is formed of a transparent resin film (PET) (see Figure 1; and paragraph (0025).

Regarding claim 7, the solar cell element **1** comprises four amorphous semiconductor layers **12**, **13**, **16** and **17** (see Figure 2; and paragraph 0024).

The solar cell module of JP '791 differs from the instant invention because JP '791 does not disclose that the front surface side light transmitting member contains sodium and that a p-n junction is formed between the crystalline substrate and the thin film amorphous semiconductor layer such that the crystalline substrate is formed between the thin film amorphous semiconductor layer and the light incidence side light transmitting member, as recited in claim 1 .

Regarding claim 1, Yamagishi et al discloses the use of soda lime glass, which contains sodium, as a surface member (see col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of JP '791 to use soda lime glass as the front surface member, as taught by Yamagishi et al, because soda lime glass is very inexpensive and provides excellent weather resistance. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

JP '791 discloses an intrinsic layer **12** between the n-type crystalline substrate **11** and the p-type amorphous layer **13** (see Figure 2; and paragraph 0024). Intrinsic layers help reduce recombination at the junction, but do not alter the operation of the junction between the p-type and n-type semiconductor layers. (On page 5 of Applicant's response received February 27, 2004, Applicant acknowledges the junction of JP '791 as a p-n junction.) Green et al teaches that intrinsic layers are optional (see col. 4, lines

61-63). The omission of an element and its function is obvious if the function of the element is not desired. *Ex parte Wu*, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). See MPEP 2144.04. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell element of JP '791 by deleting the intrinsic layer because the omission of an element and its function is obvious if the function is not desired and Green et al teaches that intrinsic layers are optional.

Regarding the position of the crystalline substrate with respect to the thin film amorphous layer and the light incidence side light transmitting member, the solar cell module of JP '791 allows light to enter from both sides (Figure 1), but the front surface side light transmitting member **3** is at the principal light incidence side (see paragraphs 0023 and 0026-0028). Therefore, light coming in from either direction contributes to the generation of electricity. Furthermore, with respect to the solar cell in JP '791's Figure 2, note in JP '791's paragraph 0024 that it is taught that on one principal plane of the crystalline silicon substrate **11**, there is laminated an i-type a-Si layer **12** and p-type a-Si layer **13**. It is also taught that on the principal plane on another side of the crystalline silicon substrate **11** there is laminated i-type a-Si layer **16** and n-type a-Si layer **17** (see paragraph 0024). JP '791 does not require said one principal plane on which the i-type a-Si layer **12** and p-type a-Si layer **13** to be the front face. JP '791 exemplifies the front face and recites "front face" in parenthesis for layers **12** and **13**, and exemplifies the rear face and recites "rear face" in parenthesis for layers **16** and **17** (see paragraph 0024; and Figure 2). However, JP '791 does not require layers **12** and **13** to be at the

front surface and layers **16** and **17** to be at the rear face. Thus, a skilled artisan readily recognizes that the solar cell seen in Figure 2 of JP '791 can be placed in JP '791's module in Figure 1 with layers **12** and **13** at the front face (i.e., layers **12** and **13** closer to light transmitting member **3**) or at the rear face (i.e., layers **12** and **13** closer to rear surface member **4**). Such is the case because the solar cell in said Figure 2 can receive light from both sides (see Figure 1; and the first sentence of paragraph 0024). When said layers **12** and **13** are at the rear face, the p-n junction between layers **11** and **13** is also at the rear face, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **3** and a-Si layer **13**. Furthermore, the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr (Figures 2 and 4; and col. 1, line 60 through col. 2, line 25) and Spitzer (see Figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared JP '701's solar cell module such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **3** and a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the light transmitting member **3** or the rear surface member **4**; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer.

7. Claims 1, 2, 4, 5, and 7 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Hanoka et al (U.S. Patent 6,353,042) in view of Yamagishi et al (U.S. Patent 6,300,556), JP 11-307791 (JP '791), Green et al (U.S. Patent 5,942,050), Brandhorst, Jr (U.S. Patent 4,131,486), and Spitzer (U.S. Patent 4,667,060).

Regarding claim 1, Hanoka et al disclose a solar cell module having a plurality of solar cells **22** encapsulated within a sealing material **10** (see Figure 2). A front surface light transmitting member **26** is made of glass and is at the principal light incidence side, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (see col. 5, line 65 to col. 6, line 9). A transparent film would allow light to enter from both sides of the solar cell. The solar cells **22** may comprise crystalline or amorphous material and may be made of silicon or one of several other semiconductor materials (see col. 1 , lines 31-35; and col. 6, lines 19-59). Hanoka et al specifically discloses a module as shown in figure 2, "a solar cell module **20** in which the encapsulant material **10** encapsulates interconnected crystalline silicon solar cells **22**" (see col. 5, lines 55-57). Hanoka et al is silent on the details of the junction within the crystalline silicon solar cells **22**.

Regarding claims 2, 4, and 5, Hanoka et al discloses a front surface light transmitting member **26** is made of glass, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (see col. 5, line 65 to col. 6, line 9). This structure permits light to enter from either side of the solar cell. The solar cell module disclosed by Hanoka et al differs from the instant invention because Hanoka et al does not disclose the following:

a. The front surface member containing sodium, as recited in claim 1 .

b. The solar cell having a p- or n-type crystalline silicon substrate and an n- or p-type semiconductor layer formed on the substrate to form a p-n junction, as recited in claim 1 .

c. The p-n junction is formed between the crystalline substrate and the thin film amorphous semiconductor layer such that the crystalline substrate is formed between the thin film amorphous semiconductor layer and the light incidence side light transmitting member, as recited in claim 1.

Regarding claim 1, Yamagishi et al discloses the use of soda lime glass, which contains sodium, as a surface member (see col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al to use soda lime glass as the front surface member, as taught by Yamagishi et al, because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding claim 1, JP '791 disclose a solar cell module comprising solar cells **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (see Figure 1; and paragraph 0023). The solar cell **1** comprises a n-type crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon, including p-type layer **13** (see Figure 2; and paragraph 0024). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (see Figure 2; and

paragraph 0024). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (see Figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by JP '791, because the solar cell of JP '791 efficiently utilizes all of the light incident on both sides of the solar cell.

JP '791 discloses an intrinsic layer **12** between the n-type crystalline substrate **11** and the p-type amorphous layer **13**. Intrinsic layers help reduce recombination at the junction, but do not alter the operation of the junction between the p-type and n-type semiconductor layers. (On page 5 of Applicant's response received February 27, 2004, Applicant acknowledges the junction of JP '791 as a p-n junction.) Green et al teaches that intrinsic layers are optional (see col. 4, lines 61-63). The omission of an element and its function is obvious if the function of the element is not desired. *Ex parte Wu*, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). See MPEP 2144.04. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell element of JP '791 by deleting the intrinsic layer because the omission of an element and its function is obvious if the function is not desired and Green et al teaches that intrinsic layers are optional.

Regarding the position of JP '791's crystalline substrate with respect to JP '791's thin film amorphous layer and Hanoka et al's front surface light transmitting member **26**, Hanoka et al's module allows light to enter from both sides since both the front surface

light transmitting member **26** and the rear surface member **28** are transparent, as noted above. Therefore, light coming in from either direction contributes to the generation of electricity. Furthermore, with respect to the solar cell in JP '791's Figure 2, note in JP '791's paragraph 0024 that it is taught that on one principal plane of the crystalline silicon substrate **11**, there is laminated an i-type a-Si layer **12** and p-type a-Si layer **13**. It is also taught that on the principal plane on another side of the crystalline silicon substrate **11** there is laminated i-type a-Si layer **16** and n-type a-Si layer **17** (see paragraph 0024). JP '791 does not require said one principal plane on which the i-type a-Si layer **12** and p-type a-Si layer **13** to be the front face. JP '791 exemplifies the front face and recites "front face" in parenthesis for layers **12** and **13**, and exemplifies the rear face and recites "rear face" in parenthesis for layers **16** and **17** (see paragraph 0024; and Figure 2). However, JP '791 does not require layers **12** and **13** to be at the front surface and layers **16** and **17** to be at the rear face. Thus, a skilled artisan readily recognizes that the solar cell seen in Figure 2 of JP '791 can be placed in Hanoka et al's module in Figure 2 with layers **12** and **13** at the front face (i.e., layers **12** and **13** closer to light transmitting member **26**) or at the rear face (i.e., layers **12** and **13** closer to rear surface member **28**). Such is the case because the solar cell in JP '791's Figure 2 can receive light from both sides (see Figure 1; and the first sentence of paragraph 0024). When said layers **12** and **13** are at the rear face, the p-n junction between layers **11** and **13** is also at the rear face, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **26** of Hanoka et al and said a-Si layer **13**. Furthermore, the presence of a p-n junction at the rear face of a solar cell is well known

in the art as shown by Brandhorst, Jr (Figures 2 and 4; and col. 1, line 60 through col. 2, line 25) and Spitzer (see Figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared Hanoka et al's solar cell module such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **26** of Hanoka et al and the a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the light transmitting member **26** or the rear surface member **28**; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of the p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 1, 2, 4, 5, and 7 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of U.S.

Patent No. 6,818,819 in view of JP 11-307791 (herein referred to as JP '791), Green et al (U.S. Patent 5,942,050), Brandhorst, Jr (U.S. Patent 4,131,486), and Spitzer (U.S. Patent 4,667,060). The claims of the '819 patent teach the limitation of the instant claims, the difference being that the claims of the '819 patent do not specifically teach its rear surface resin film is transparent; that its solar cells have a p- or n-type crystalline silicon substrate and an n-or p-type semiconductor layer formed on the substrate to form a p-n junction; and that the p-n junction is formed between the crystalline substrate and the thin film amorphous semiconductor layer such that the crystalline substrate is formed between the thin film amorphous semiconductor layer and the light transmitting member on the front surface. JP '791 disclose a solar cell module comprising solar cells **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (see Figure 1; and paragraph 0023). The solar cell **1** comprises a n-type crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon, including p-type layer **13** (see Figure 2; and paragraph 0024). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (see Figure 2; and paragraph 0024). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (see Figure 1). The resin film rear surface member **4** is transparent and made of PET (see Figure 1; and paragraph 0023).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the solar cell module in the claims of the '819 patent so as to use a transparent resin such as PET for the rear surface resin film in

said claims because the use of a transparent resin film, such as PET, is conventional in the art, as shown by JP '791.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module in the claims of the '819 patent to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by JP '791, because the solar cell of JP '791 efficiently utilizes all of the light incident on both sides of the solar cell.

JP '791 discloses an intrinsic layer **12** between the n-type crystalline substrate **11** and the p-type amorphous layer **13**. Intrinsic layers help reduce recombination at the junction, but do not alter the operation of the junction between the p-type and n-type semiconductor layers. (On page 5 of Applicant's response received February 27, 2004, Applicant acknowledges the junction of JP '791 as a p-n junction.) Green et al teaches that intrinsic layers are optional (see col. 4, lines 61-63). The omission of an element and its function is obvious if the function of the element is not desired. *Ex parte Wu*, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). See MPEP 2144.04. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell element of JP '791 by deleting the intrinsic layer because the omission of an element and its function is obvious if the function is not desired and Green et al teaches that intrinsic layers are optional.

Regarding the position of JP '791's crystalline substrate with respect to JP '791's thin film amorphous layer and the front surface light transmitting member in the claims of the '819 patent, JP '791 module allows light to enter from both sides since both the

front surface light transmitting member **3** and the rear surface member **4** are transparent. Therefore, light coming in from either direction contributes to the generation of electricity. Furthermore, with respect to the solar cell in JP '791's Figure 2, note in JP '791's paragraph 0024 that it is taught that on one principal plane of the crystalline silicon substrate **11**, there is laminated an i-type a-Si layer **12** and p-type a-Si layer **13**. It is also taught that on the principal plane on another side of the crystalline silicon substrate **11** there is laminated i-type a-Si layer **16** and n-type a-Si layer **17** (see paragraph 0024). JP '791 does not require said one principal plane on which the i-type a-Si layer **12** and p-type a-Si layer **13** to be the front face. JP '791 exemplifies the front face and recites "front face" in parenthesis for layers **12** and **13**, and exemplifies the rear face and recites "rear face" in parenthesis for layers **16** and **17** (see paragraph 0024; and Figure 2). However, JP '791 does not require layers **12** and **13** to be at the front surface and layers **16** and **17** to be at the rear face. Thus, a skilled artisan readily recognizes that the solar cell seen in Figure 2 of JP '791 can be placed in the solar cell module in the claims of the '819 patent with layers **12** and **13** at the front face (i.e., layers **12** and **13** closer to the front surface light transmitting member) or at the rear face (i.e., layers **12** and **13** closer to rear surface resin film). Such is the case because the solar cell in JP '791's Figure 2 can receive light from both sides (see Figure 1; and the first sentence of paragraph 0024). When said layers **12** and **13** are at the rear face, the p-n junction between layers **11** and **13** is also at the rear face, and thus, the crystalline silicon substrate **11** is between the front surface light transmitting member in the claims of the '819 patent and said a-Si layer **13**. Furthermore, the presence of a p-n junction at

the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr (Figures 2 and 4; and col. 1, line 60 through col. 2, line 25) and Spitzer (see Figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared the solar cell module in the claims of the '819 patent such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between the front face light transmitting member of said claims and the a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the front surface light transmitting member or the rear surface resin; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of the p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer.

10. Claims 1, 2, 4, 5, and 7 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of U.S. Patent No. 6,667,434 in view of JP 11-307791 (herein referred to as JP '791), Green et al (U.S. Patent 5,942,050), Brandhorst, Jr (U.S. Patent 4,131,486), and Spitzer (U.S. Patent 4,667,060). The claims of the '434 patent teach the limitation of the instant claims, the difference being that the claims of the '434 patent do not specifically teach its rear surface member is a transparent resin; that its solar cells have a p- or n-type crystalline silicon substrate and an n-or p-type semiconductor layer formed on the substrate to form a p-n junction; and that the p-n junction is formed between the crystalline substrate and the thin film amorphous semiconductor layer such that the

crystalline substrate is formed between the thin film amorphous semiconductor layer and the light transmitting member on the front surface. JP '791 disclose a solar cell module comprising solar cells **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (see Figure 1; and paragraph 0023). The solar cell **1** comprises a n-type crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon, including p-type layer **13** (see Figure 2; and paragraph 0024). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (see Figure 2; and paragraph 0024). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (see Figure 1). The resin film rear surface member **4** is transparent and made of PET (see Figure 1; and paragraph 0023).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the solar cell module in the claims of the '434 patent so as to use a transparent resin such as PET for the rear surface member in said claims because the use of a transparent resin film, such as PET, is conventional in the art, as shown by JP '791.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module in the claims of the '434 patent to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by JP '791, because the solar cell of JP '791 efficiently utilizes all of the light incident on both sides of the solar cell.

JP '791 discloses an intrinsic layer **12** between the n-type crystalline substrate **11** and the p-type amorphous layer **13**. Intrinsic layers help reduce recombination at the junction, but do not alter the operation of the junction between the p-type and n-type semiconductor layers. (On page 5 of Applicant's response received February 27, 2004, Applicant acknowledges the junction of JP '791 as a p-n junction.) Green et al teaches that intrinsic layers are optional (see col. 4, lines 61-63). The omission of an element and its function is obvious if the function of the element is not desired. *Ex parte Wu*, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). See MPEP 2144.04. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell element of JP '791 by deleting the intrinsic layer because the omission of an element and its function is obvious if the function is not desired and Green et al teaches that intrinsic layers are optional.

Regarding the position of JP '791's crystalline substrate with respect to JP '791's thin film amorphous layer and the front surface light transmitting member in the claims of the '434 patent, JP '791 module allows light to enter from both sides since both the front surface light transmitting member **3** and the rear surface member **4** are transparent. Therefore, light coming in from either direction contributes to the generation of electricity. Furthermore, with respect to the solar cell in JP '791's Figure 2, note in JP '791's paragraph 0024 that it is taught that on one principal plane of the crystalline silicon substrate **11**, there is laminated an i-type a-Si layer **12** and p-type a-Si layer **13**. It is also taught that on the principal plane on another side of the crystalline silicon substrate **11** there is laminated i-type a-Si layer **16** and n-type a-Si layer **17** (see

paragraph 0024). JP '791 does not require said one principal plane on which the i-type a-Si layer **12** and p-type a-Si layer **13** to be the front face. JP '791 exemplifies the front face and recites "front face" in parenthesis for layers **12** and **13**, and exemplifies the rear face and recites "rear face" in parenthesis for layers **16** and **17** (see paragraph 0024; and Figure 2). However, JP '791 does not require layers **12** and **13** to be at the front surface and layers **16** and **17** to be at the rear face. Thus, a skilled artisan readily recognizes that the solar cell seen in Figure 2 of JP '791 can be placed in the solar cell module in the claims of the '434 patent with layers **12** and **13** at the front face (i.e., layers **12** and **13** closer to front surface light transmitting member) or at the rear face (i.e., layers **12** and **13** closer to rear surface member). Such is the case because the solar cell in JP '791's Figure 2 can receive light from both sides (see Figure 1; and the first sentence of paragraph 0024). When said layers **12** and **13** are at the rear face, the p-n junction between layers **11** and **13** is also at the rear face, and thus, the crystalline silicon substrate **11** is between the front surface light transmitting member in the claims of the '434 patent and said a-Si layer **13**. Furthermore, the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr (Figures 2 and 4; and col. 1, line 60 through col. 2, line 25) and Spitzer (see Figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared the solar cell module in the claims of the '434 patent such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between the front face light transmitting member of said claims and the

a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the front surface light transmitting member or the rear surface resin; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of the p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer.

Response to Arguments

11. Applicant's arguments filed July 5, 2005 have been fully considered but they are not persuasive.

Applicant argues that the abstract of JP '791 discloses that the glass plate **3** is positioned on the surface side of the module to which more light enters, that positioning a p-n junction as close as possible to the principal light incident side is well known in the art, and that in JP '791, the thin film amorphous semiconductor layer (13) which forms the p-n junction with the crystalline silicon substrate (11) is disposed near the principal light incidence side "as would be expected by one or ordinary skill in the art." Applicant argues that "[i]n contrast to that which is well known in the art, claim 1 recites the thin film amorphous semiconductor layer (a-Si layer) is positioned opposite the light incidence side light transmitting member by interposing the crystalline silicon substrate therebetween", and that since the claimed invention recites a feature "that opposes that which is well known in the art", the claimed invention would not have been obvious. However, these argument are not deemed to be persuasive. Firstly, the Examiner agrees that glass plate **3** of JP '791 is on the surface side of the module to which more light enters. However, JP '791 is not limited to the p-n junction being as close as

possible to the light incidence side. Furthermore, the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr (Figures 2 and 4; and col. 1, line 60 through col. 2, line 25) and Spitzer (see Figure 1). As set forth above, the Examiner maintains that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared JP '701's solar cell module such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **3** and a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the light transmitting member **3** or the rear surface member **4**; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have prepared Hanoka et al's solar cell module such that the solar cell in JP '791's Figure 2 is present in the module with the p-n junction between layers **11** and **13** at the rear face of the solar cell, and thus, the crystalline silicon substrate **11** is between principal light transmitting member **26** of Hanoka et al and the a-Si layer **13** because light can enter from both sides of JP '791's solar cell and thus, the p-n junction can be closer to either the light transmitting member **26** or the rear surface member **28**; JP '791 is not limited to layers **12** and **13** to be at the front surface; and the presence of a p-n junction at the rear face of a solar cell is well known in the art as shown by Brandhorst, Jr and Spitzer.

Applicant argues that none of Yamagishi et al, Green et al, and Hanoka et al "alone or combined, discloses or suggests a thin film amorphous semiconductor layer which forms the p-n junction between the crystalline silicon substrate is positioned opposite the light incidence side light transmitting member by interposing the crystalline silicon substrate therebetween; and the light incidence side light transmitting member is positioned at a principal light incidence side, as recited in claim 1." However, this argument is not deemed to be persuasive because, it is the Examiner's position that it is JP '791 in view of Yamagishi et al, Green et al, Brandhorst, Jr, and Spitzer render obvious claim 1 and its dependent claims. Furthermore, Hanoka et al in view of Yamagishi et al, JP 11-307791, Green et al, Brandhorst, Jr, and Spitzer render obvious claim 1 and its dependent claims.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Alan Diamond
Primary Examiner
Art Unit 1753

Alan Diamond
July 12, 2005